

I Claim:

1. A method of photodynamic disruption of cellular organisms comprising:  
 providing a surface acting agent containing benzalkonium chloride in association with a cellular organism, said surface acting agent disorienting a cell membrane so that said cell membrane no longer functions as an effective osmotic barrier;  
 providing a photosensitive material in association with the cellular organism; and  
 applying light in association with the cellular organism to cause a cellular disruption of the cellular organism.
2. The method of cellular organism disruption of claim 1 wherein the step of providing the surface acting agent and the step of providing the photosensitive material occur simultaneously by providing a combined solution in proximity to the cellular organism.
3. The method of cellular organism disruption of claim 2 wherein the combined solution is provided in proximity to the cellular organism via one or more of the group containing: a surface release of the combined solution, an injection proximate the cellular organism, an intravenous injection, a subcutaneous injection, inhalation, and a topical application.
4. The method of cellular organism disruption of claim 1 wherein the step of providing the surface acting agent and the step of providing the photosensitive material is via an impregnation of the surface acting agent and the photosensitive material on a surface of a medical prosthesis.
5. The method of cellular organism disruption of claim 1 wherein the photosensitive material is monomeric, dimeric, or polymeric.
6. The method of cellular organism disruption of claim 1 wherein the cellular organism is associated with one of the following: a sterilization procedure, a biofilm eradication procedure,

a treatment of an infection at a tissue site, eradication of cancer cells, and an air filtration / decontamination process.

7. The method of cellular organism disruption of claim 1 wherein the cellular organism is a microbe, a spore, a fungus, or a cancer cell.

8. The method of cellular organism disruption of claim 1 wherein the surface acting agent contains benzalkonium chloride provided in a concentration range of between 0.001 % to 1%.

9. The method of cellular organism disruption of claim 1 wherein the surface acting agent contains benzalkonium chloride provided in a concentration range of between 0.005 % to 0.05%.

10. The method of cellular organism disruption of claim 1 wherein the step of providing the surface acting agent precedes the step of providing the photosensitive material by between 1 to 30 minutes.

11. The method of cellular organism disruption of claim 1 wherein the step of applying light in association with the cellular organism occurs for a period of between 5 seconds to 1 hour and results in cellular organism death.

12. The method of cellular organism disruption of claim 1 wherein the step of applying a light includes a light wavelength ranging from 450 nm to 780 nm and a light dosage ranging from 10 J/cm<sup>2</sup> to 100 J/cm<sup>2</sup> and a light dosage rate ranging from 50 mw/cm<sup>2</sup> to 250 mw/cm<sup>2</sup>.

13. The method of cellular organism disruption of claim 1 wherein the step of providing the surface acting agent includes providing more than one of a plurality of different surface acting agents.

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14. The method of cellular organism disruption of claim 13 wherein the step of providing the photosensitive material includes providing more than one of a plurality of different photosensitive materials.

15. A method of photodynamic disruption of acellular organisms comprising:

providing a surface acting agent containing benzalkonium chloride in association with an acellular organism, said surface acting agent disorienting a membrane of the acellular organism so that said membrane no longer functions as an effective osmotic barrier;

providing a photosensitive material in association with the acellular organism, said photosensitive material being accumulated within the membrane and cytoplasm of the acellular organism; and

applying light in association with the acellular organism to cause a disruption of the acellular organism.

16. The method of acellular organism disruption of claim 15 wherein the step of providing the surface acting agent and the step of providing the photosensitive material occur simultaneously by providing a combined solution in proximity to the acellular organism.

17. The method of acellular organism disruption of claim 15 wherein the combined solution is provided in proximity to the acellular organism via one or more of the group containing: an injection proximate the acellular organism, an intravenous injection, inhalation, a subcutaneous injection, and a topical application.

18. The method of acellular organism disruption of claim 15 wherein the step of providing the surface acting agent and the step of providing the photosensitive material is via an impregnation of the surface acting agent and the photosensitive material on a surface of a medical prosthesis.

19. The method of acellular organism disruption of claim 15 wherein the acellular organism is associated with one of the following: a sterilization procedure, a biofilm eradication procedure, an air filtration / decontamination device, and a treatment of an infection at a tissue site.

20. The method of acellular organism disruption of claim 15 wherein the photosensitizing agent is monomeric, dimeric, or polymeric.

21. The method of acellular organism disruption of claim 15 wherein the benzalkonium chloride is provided in a concentration range of between 0.001 % to 1%.

22. The method of acellular organism disruption of claim 15 wherein the benzalkonium chloride is provided in a concentration range of between 0.005 % to 0.5%.

23. The method of acellular organism disruption of claim 15 wherein the step of applying light results in acellular organism destruction.

24. The method of acellular organism disruption of claim 15 wherein the step of applying light occurs for a period of between 5 seconds to 1 hour and results in acellular organism death.

25. The method of acellular organism disruption of claim 24 wherein the step of applying light occurs for a period of between 2 to 20 minutes.

26. The method of acellular organism disruption of claim 15 wherein the step of providing the surface acting agent precedes the step of providing the photosensitive material by between 1 to 30 minutes.

27. The method of acellular organism disruption of claim 15 wherein the step of providing the surface acting agent includes providing more than one of a plurality of different surface acting agents.

28. The method of acellular organism disruption of claim 15 wherein the step of providing the photosensitive material includes providing more than one of a plurality of different photosensitive materials.

29. The method of acellular organism disruption of claim 15 wherein the step of applying a light includes a light wavelength ranging from 450 nm to 780 nm and a light dosage ranging from 10 J/cm<sup>2</sup> to 100 J/cm<sup>2</sup> and a light dosage rate ranging from 50 mw/cm<sup>2</sup> to 250 mw/cm<sup>2</sup>.

30. The method of acellular organism disruption of claim 15 wherein the acellular organism is from a group containing: a virus, a spore, and a plasmid.

31. A method of photodynamic disruption of cells comprising the steps of:

identifying an area of cell activity;

providing a concentration including a combination of a benzalkonium chloride compound and a photosensitive material in association with the area of cell activity, said benzalkonium chloride compound disorienting a cell membrane so that said membrane no longer functions as an effective osmotic barrier, and so that said photosensitive material is able to pass through the disoriented cell membrane; and

exposing the area of cell activity to light having a light wavelength, a light dosage and a light dosage rate to cause photodynamic cellular disruption.

32. The method of photodynamic disruption of cells of claim 31 wherein the step of identifying an area of cell activity includes an examination and identification of a cell site on a living body, and the step of providing the concentration includes an application of the concentration to the cell site of the living body.

33. The method of photodynamic disruption of cells of claim 31 wherein the step of identifying an area of cell activity includes identifying a medical prosthesis or device for a sterilization procedure, and the step of providing the concentration includes an application of the concentration to a cell site of the prosthesis.

34. The method of photodynamic disruption of cells of claim 31 wherein the step of identifying an area of cell activity includes identifying an air filtration / decontamination device, and the step of providing the concentration includes an application of the concentration to a cell site within the device.

35. A kit for potentiation of a photodynamic therapy of a pathogenic cellular or acellular organism, said photodynamic therapy utilizing a light source for a photodynamic disruption of the pathogenic cellular or acellular organism, said kit comprising:

a compound including benzalkonium chloride adapted to be provided to the pathogenic organism, said compound disrupting a pathogenic organism membrane so that said membrane no longer functions as an effective osmotic barrier; and

a photosensitive material adapted to be dispensed to the pathogen organism and reactive with light from the light source to result in a photodynamic pathogenic organism disruption.

36. The kit according to claim 35 wherein the compound disrupts a spore membrane so that said spore membrane no longer functions as an effective osmotic barrier, and the combination of photosensitive material and light result in spore death.

37. The kit according to claim 35 wherein the compound disrupts a cancer cell membrane so that said cancer cell membrane no longer functions as an effective osmotic barrier, and the combination of photosensitive material and light result in death of the cancer cell.

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38. The kit according to claim 35 wherein the compound and the photosensitive material are provided in a combined solution capable of being simultaneously dispensed to the pathogenic organism site.

39. The kit according to claim 35 further comprising a light source for initiating a photodynamic reaction of the photosensitive material.

40. A method of photodynamic eradication of organisms within a biofilm of a medical prosthesis, said method comprising the steps of:

providing a photosensitive material and a surfactant to a surface of the prosthesis supporting a biofilm;

providing a source of light illumination having predetermined light characteristics; and illuminating the biofilm layer with the light source to achieve a photodynamic eradication of organisms within the biofilm layer.

41. The method of claim 41 wherein the surfactant is benzalkonium chloride.

42. The method of claim 41 wherein the step of providing the photosensitive material and the surfactant is via an impregnation of compounds upon a surface of the prosthesis.

43. The method of claim 41 wherein the step of illuminating the biofilm layer is achieved by an internal illumination of the prosthesis.

44. The method of claim 41 wherein the step of illuminating the biofilm layer is achieved by an external light source illuminating the biofilm layer.

45. A method of photodynamic eradication of organisms within a biofilm layer of an endotracheal tube, said method comprising the steps of:

providing a photosensitive material and a surfactant to a surface of the endotracheal tube supporting a biofilm layer;

providing a source of light illumination having predetermined light characteristics; and  
illuminating the biofilm layer of the endotracheal tube with the light source to achieve a  
photodynamic eradication of organisms within the biofilm layer.

46. The method of claim 45 wherein the surfactant is benzalkonium chloride.

47. The method of claim 45 wherein the step of providing the photosensitive material  
and the surfactant is via an impregnation of compounds upon a surface of the endotracheal tube.

48. The method of claim 45 wherein the step of illuminating the biofilm layer is  
achieved by an internal illumination of the endotracheal tube.

49. A method of photodynamic eradication of organisms within a biofilm layer of an  
intravascular catheter, said method comprising the steps of:

providing a photosensitive material and a surfactant to a surface of the intravascular  
catheter supporting a biofilm layer;

providing a source of light illumination having predetermined light characteristics; and  
illuminating the biofilm layer of the intravascular catheter with the light source to achieve  
a photodynamic eradication of organisms within the biofilm layer.

50. The method of claim 49 wherein the surfactant is benzalkonium chloride.

51. The method of claim 49 wherein the step of providing the photosensitive material  
and the surfactant is via an impregnation of compounds upon a surface of the intravascular  
catheter.

52. The method of claim 49 wherein the step of illuminating the biofilm layer is  
achieved by an internal illumination of the intravascular catheter.

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